

## SECTION 26 01 26

### SUBMITTALS AND SHOP DRAWINGS

#### **PART 1 - GENERAL**

##### 1.01 REQUIREMENTS

- A. Refer to General Divisions for submittal requirements and procedures.

##### 1.02 DEFINITIONS

- A. **Manufacturer's Product Data:** Manufacturer's product data consist of one or more levels of manufacturer's information as described below and as requested in the submittal schedule. The three levels of information include: manufacturer's list, manufacturer's catalog data, and manufacturer's technical and engineering data.
1. **Manufacturer's List:** Manufacturer's list shall include a typewritten list of manufacturer's name, sizes and model or catalog numbers, referenced to the specification section.
  2. **Manufacturer's Catalog Data:** Manufacturer's catalog data shall include standard catalog information marked to indicate specific equipment proposed and point of operation, if appropriate. Include installation instructions.
  3. **Manufacturer's Technical and Engineering Data:** Manufacturer's technical and engineering data shall include materials, dimensions, details, installation instructions, weights, capacities, illustrations, wiring diagrams, control diagrams, piping diagrams, connection diagrams, performance data (including performance curves), mix design, and any other information required for a complete and thorough evaluation of the equipment or items specified, and to verify compliance with specifications. Control diagrams or control schematics, where specified and required by the submittal schedule, shall include a detailed schematic of the proposed control modifications and their interface with existing control equipment, where appropriate, and a manufacturer and model number listing of all proposed control components shown on the control schematic.
- B. **Shop Drawings:** Shop drawings are construction drawings of items manufactured specifically for this project. Shop drawings include dimensions, construction details, weights, and additional information to identify the physical features of the system or piece of equipment.
- C. **Samples:** Samples illustrate functional characteristics of the product with integral parts and attachment devices. Samples shall allow evaluation of full range of manufacturer's standard colors, textures, and patterns.
- D. **Certificates, Test Data or Other Information:** Requirements for certificates, test data, or other information will be listed under referenced specification sections.

##### 1.03 SUBMITTALS REQUIRED

- A. **Product Evaluation Data.** The submittal schedule for product evaluation data is as indicated below. Each item requiring a submittal is given the following code:
1. Manufacturer's list
  2. Manufacturer's catalog data
  3. Manufacturer's technical and engineering data
  4. Shop drawings

- 5. Samples
- 6. Certificates
- 7. Test data
- 8. Worker's qualifications
- 9. See individual sections for special requirements

1.04 SUBMITTAL SCHEDULE

Division 26 – Electrical Codes

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Section 26 05 29 .... Hangers and Supports for Electrical Systems ..... 1,2  
 Section 26 05 33 .... Raceways and Boxes for Electrical Systems..... 1,2

**PART 2 - PRODUCTS**

2.1 THIS PART NOT USED

**PART 3 - EXECUTION**

3.1 THIS PART NOT USED

END OF SECTION

## SECTION 26 05 00

### COMMON WORK RESULTS FOR ELECTRICAL

#### **PART 1 - GENERAL**

##### 1.01 CONTRACT DOCUMENTS

- A. The Contract Documents are complementary. What is required by any one, as affects this Division, shall be as binding as if repeated herein.
- B. Separation of this Division from other Contract Documents shall not be construed as complete segregation of the Work.
- C. Particular attention is called to Advertisement For Bids, Instructions to Bidders, Supplemental Instructions to Bidders, General Conditions, Supplemental General Conditions, Drawings and Specifications, and modifications incorporated in the documents before execution of the Agreement.

##### 1.02 SCOPE OF WORK

- A. General: Provide and install complete and satisfactorily operating electrical systems as specified in this Division, as shown on Drawings, as required, and as reasonably intended. Work generally includes, but is not limited to electrical distribution, lighting, devices, wiring systems and control systems.
- B. Omissions: Omission of expressed reference to any item of labor or material necessary for the proper execution of the work shall not relieve responsibility from providing such additional labor or material.

##### 1.03 EXAMINATION OF SITE

- A. Examine Site of Work before making Bid and ascertain all related physical conditions.
- B. Field verify scale dimensions shown since exact locations, distances and levels will be governed by actual field conditions.
- C. Owner will not be responsible for any loss or unanticipated costs which may be suffered by the successful Bidder as a result of such Bidder's failure to fully inform itself in advance in regard to all conditions pertaining to the Work and character of the Work.

##### 1.04 COORDINATION OF TRADES

- A. Check Drawings of other trades to avert possible installation conflicts. Should major changes from original Drawings be necessary to resolve such conflicts, notify Architect and secure written approval and agreement on necessary adjustments before installation is started.
- B. Check equipment connections and equipment locations on the job for coordination with other Divisions equipment and connections, structure, and the like.

1.05 MINOR DEVIATIONS

- A. Make minor changes in equipment connections and equipment locations as directed or required before rough-in without extra cost.

1.06 SUBSTITUTIONS

- A. Equal material of other manufacturer may be used following Architect's approval of a written request submitted at least 7 working days prior to bid date.

1.07 RECORD DRAWINGS

- A. Maintain a marked set of prints at job site at all times. Show all changes from contract drawings, whether visible or concealed. Dimension accurately from building lines, floor or curb elevations. Show exact location, elevation, and size of conduit, access panel and doors, and all other information pertinent to the work.
- B. At project completion, submit marked set to Architect for approval.

1.08 WARRANTY

- A. Warrant all work, materials, and equipment for one year.

**PART 2 - PRODUCTS**

2.01 THIS PART NOT USED

**PART 3 - EXECUTION**

3.01 THIS PART NOT USED

END OF SECTION

## SECTION 26 05 01

### ELECTRICAL DEMOLITION

#### **PART 1 - GENERAL**

##### 1.01 SCOPE

- A. It is the intent of these documents to provide the necessary information and adjustments to the electrical system required to meet Code and accommodate installation of the new work.
- B. Contractor shall coordinate with the Owner so that work can be scheduled not to interrupt operations, normal activities, building access, and access to different areas. The Owner will cooperate to the best of their ability to assist in a coordinated schedule, but will remain the final authority as to time of work permitted.

##### 1.02 EXISTING CONDITIONS:

- A. The locations of existing utilities and equipment are shown in an approximate way only and have not been independently verified by the Owner or its representative. The Contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the Contractor's failure to exactly locate and preserve any and all utilities and equipment. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on the Drawings.

#### **PART 2 - PRODUCTS**

##### 2.01 MATERIALS

- A. All materials accumulated during the demolition process are the Owner's property and shall be removed from the job site as directed by the Owner.

#### **PART 3 - EXECUTION**

##### 3.01 DEMOLITION

- A. Remove all existing fixtures, clocks, switches, receptacles, and other electrical equipment and devices and associated wiring from walls, ceilings, floors, and other surfaces scheduled for remodeling, relocation, or demolition unless specifically shown as retained or relocated on the Drawings.
- B. Disconnect all existing mechanical equipment scheduled for removal, relocation or abandonment. See mechanical Drawings for scope of work. Remove abandoned cables and unusable raceways. Relabel panels and motor control centers to reflect changes.
- C. Maintain electrical continuity of all existing systems. Remove or relocate electrical boxes, conduit, wiring, equipment, fixtures, etc. as may be encountered in removed or remodeled areas in the existing construction affected by this work. Wiring which serves usable existing outlets shall be removed and restored clear of the construction or demolition. If existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing electrical equipment which is being retained, new conduit

and wire shall be provided to bypass the abandoned outlets. If existing conduits pass through partitions or ceiling which are being removed or remodeled, new conduit and wire shall be provided to reroute clear of the construction or demolition and maintain service to the existing load.

- D. Extend circuiting and devices in all existing walls to be furred out.
- E. Existing electrical outlets and light fixtures are denoted by dotted or dashed lines. Verify exact location of existing electrical outlets and light fixtures in the field. Only partial existing electrical shown. Locations of items shown on the Drawings as existing are partially based on as-built and other drawings which may contain errors. The contractor shall verify the accuracy of the information shown prior to bidding and provide such labor and material as is necessary to accomplish the intent of the contract documents.
- F. Remove all abandoned wiring to leave site clean.
- G. Keep outages to occupied areas to a minimum and prearrange all outages with the Owner's representative. Requests for outages shall state the specific dates and hours and the maximum durations, with the outages kept to these specific dates and hours and the maximum durations. This Contractor will be liable for any damages resulting from unscheduled outages or for those not confined to the preapproved times. Outages shall take place at times when the facility is not in operation or occupied by non-essential personnel. Include all costs for overtime labor as necessary to maintain electrical services in the initial bid proposal. Temporary wiring and facilities, if used, shall be removed and the site left clean before final acceptance. Requests for outages must be submitted at least (5) days prior to intended shutdown time.
- H. No circuit breaker or disconnects shall be turned off without prior approval from Owner. Coordinate with the Owner's representative responsible for the area or equipment affected for any electrical interruptions which affect the operation of the remaining portions of the facility.
- I. Verify with the General Contractor a location for storage of materials, supplies, tools, rubbish, etc. prior to start of work.

END OF SECTION

## SECTION 26 05 19

### LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### **PART 1 - GENERAL**

##### 1.01 WORK INCLUDED

- A. Wires and Cables
- B. Wire Connections

##### 1.02 REFERENCE STANDARDS

- A. National Fire Protection Association (NFPA)
  - 1. NFPA 70 National Electrical Code

##### 1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver new wire to site in new standard coils or reels with approved tag denoting length, wire size, insulation type and manufacturer's name.
- B. Protect from weather and damage during storage and handling.

#### **PART 2 - PRODUCTS**

##### 2.01 CONDUCTOR AND CABLE MATERIALS

- A. Building Wiring: 98 percent conductivity copper, 600 volt insulation, stranded. Type THHN for interior dry and damp locations. Type THWN or XHHW for wet and exterior locations.
- B. Branch Circuit Wiring: Conductors smaller than No. 12 AWG for power system branch circuits not permitted.
- C. Motor control wires shall be No. 14 minimum.
- D. Wire for special areas shall be as specified on the Drawings.

##### 2.02 TWIST-ON CONNECTOR

- A. UL pressure-type, solderless, insulated, wound spring grip twist on connector.
- B. Solderless pressure connectors for terminals, taps, and splices.

##### 2.03 COMPRESSION ADAPTER

- A. For terminating a single aluminum wire into mechanical connectors, such as a circuit breaker or set screw lugs. Burndy "Hyplug" Type AYP, or equal by Anderson, Illsco, Kearney, Mac-Adapt, T&B.

2.04 TERMINAL, CRIMP-ON

- A. Flat, fork tongue, self-insulating
- B. For connection of stranded wire to screw terminals
- C. T & B "Sta-Kon," or equal

**PART 3 - EXECUTION**

3.01 CONDUCTOR AND CABLE INSTALLATION

- A. Make conductor length for parallel feeders identical.
- B. Lace or clip groups of feeder conductors at distribution centers, pull boxes, and wireways.
- C. Provide copper grounding conductors and straps. A ground wire shall be pulled through conduits and used as the equipment grounding conductor.
- D. Install wire and cable in code conforming raceway.
- E. Use wire pulling lubricant for pulling No. 4 AWG and larger wire. UL approved type only.
- F. Install wire in conduit runs after concrete and masonry work is complete and after moisture is swabbed from conduits.
- G. Splice only in accessible junction or outlet boxes. Splice in feeders and services not permitted. Splices or taps in branch circuits permitted only in junction boxes where circuits divide.
- H. Color code conductors to designate neutral, phase, and ground as follows:

CONDUCTOR	120/208 OR	120/240/277/480
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green
Switchlegs	Pink or Tan	Pink or Tan
Travelers	Purple	Purple
Fire Alarm	Red	
Intercom/Clock/Bell	Grey	
Security	Orange	
HVAC Control	Green	
Data/Telecom	White (CAT6)	

- I. Wires shall be factory color coded by integral pigmentation. Colored plastic tape permitted on No. 6 and larger where integral pigmentation impractical. Apply tape in spiral half-lap over exposed portions in manholes, boxes, panels, switchboards and other enclosures.



- J. All circuit conductors shall be identified with circuit number at all terminals, intermediate outlets, disconnect switches, circuit breakers, motor control centers, etc. Both ends of a given conductor shall be identified alike.
- K. DO NOT install wires of different voltage systems in same raceway, box, gutter or other enclosure.
- L. Radius of cable bends shall not be less than 10 times the outer diameter of the cable.

### 3.02 CONNECTIONS AND SPLICES

- A. Follow manufacturer's instructions using manufacturers recommended tools.
- B. Stripping Insulation: Carefully strip, avoid nicking conductor. No "ringing."
- C. Design: Connectors shall be designed and approved for the purpose used. Connectors between aluminum and copper shall be listed "AL/CU" for the purpose of preventing electrolytic action.
- D. Bare Connectors and Conductor Free Ends: Wrap with insulating rubber or friction tape to equivalent insulation of wire.
- E. Ground Continuity to Metallic Surfaces: Remove any paint coating and polish surface beneath connection.
- F. Copper conductors may be terminated in any approved compression or mechanical connector, including set screws.
- G. No splices or taps permitted in feeder or branch circuit terminating in a single outlet.
- H. Branch circuit splices and taps in junction and outlet boxes: Twist-on connectors.
- I. Conductor and cable copper shall not be reduced at the terminal for making connections.
- J. Slack shall be left at equipment, pullboxes, or outlet boxes to allow for a neat termination.

END OF SECTION

## SECTION 26 05 26

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### **PART 1 - GENERAL**

##### 1.01 WORK INCLUDED

- A. Electric and power system grounding

##### 1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. Provide grounds in accordance with National Electrical Code and additional requirements as required herein.

#### **PART 2 - PRODUCTS**

##### 2.01 GROUNDING CONDUCTORS

- A. Equipment grounding conductor: Table 250-122.
- B. Material: Copper.
- C. Protection: Conductors not in raceway or concealed shall be insulated. Provide conduit where shown or required for physical protection.
- D. Bonding Jumpers: Same requirements.

#### **PART 3 - EXECUTION**

##### 3.01 POWER SYSTEM GROUNDING

- A. Circuit Grounding: Install grounding bushings, studs, and jumpers at distribution centers, pullboxes, motor control centers, panelboards, and junction boxes.
- B. Ground Connections: Clean surfaces thoroughly before applying ground lugs or clamps. If surface is coated, the coating must be removed down to the bare metal. After the coating has been removed, apply a noncorrosive approved compound to cleaned surface and install lugs or clamps. Where galvanizing is removed from metal, it shall be painted or touched up.
- C. Conduit Systems:
  - 1. Ground all metallic conduit systems.
  - 2. Non-metallic conduit systems shall contain a grounding conductor.
  - 3. Conduit provided for mechanical protection containing only a grounding conductor, bond to that conductor at the entrance and exit from the conduit.
- D. Feeders and Branch Circuits: Install green grounding conductors with feeders and branch circuits as follows:
  - 1. Feeders
  - 2. Circuits serving preparation and kitchen equipment
  - 3. Receptacle outlets
  - 4. Directly connected laboratory equipment
  - 5. Motors and motor controllers

6. Fixed equipment and appliances
  7. Items of equipment where the final connection is made with flexible metal conduit shall have a grounding wire.
  8. Additional locations and systems as shown
- E. Boxes, Cabinets, Enclosures, and Panelboards:
1. Bond the grounding wires to each pullbox, junction box, outlet box, cabinets, and other enclosures through which the ground wires pass (except for special grounding systems for intensive care units and other critical units shown).
  2. Provide lugs in each box and enclosure for ground wire termination.
  3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs for terminating the ground wires.
- F. Ground lighting fixtures to the green grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.

END OF SECTION

## SECTION 26 05 29

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### **PART 1 - GENERAL**

##### 1.01 WORK INCLUDED

- A. Raceway Supports

#### **PART 2 - PRODUCTS**

##### 2.01 RACEWAY SUPPORTS

- A. Single Runs: Steel rod hangers, galvanized single hole conduit straps, or ring bolt type hangers with specialty spring clips. Plumbers perforated tape or "J-nails" not acceptable.
- B. Multiple Runs: Conduit rack with 25 percent spare capacity. Maximum width per manufacturer's recommendations.
- C. Vertical Runs: Channel support with conduit fittings.
- D. All hardware such as inserts, straps, bolts, nuts, screws and washers shall be galvanized or cadmium-plated steel.

##### 2.02 ANCHOR METHODS

- A. Hollow Masonry and Framed Walls: Toggle bolts or spider type expansion anchors
- B. Solid Masonry: Lead expansion anchors or preset inserts
- C. Metal Surfaces: Machine screws, bolts, or welded studs
- D. Wood Surfaces: Wood screws
- E. Concrete Surfaces: Self-drilling anchors or powder-driven studs

#### **PART 3 - EXECUTION**

##### 3.01 INSTALLATION

- A. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads required.
- B. Exact location and spacing between supports per manufacturer's recommendations and NEC requirements as minimum.
- C. Conduit shall be installed in such a manner as to prevent the collection of trapped condensation. All runs of conduit shall be arranged so as to be devoid of traps wherever possible.

END OF SECTION

## SECTION 26 05 33

### RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

#### **PART 1 - GENERAL**

##### 1.01 WORK INCLUDED

- A. Conduit, Tubing, and Fittings
- B. Flexible Conduit
- C. Electrical boxes and fittings as required for a complete installation

##### 1.02 REFERENCE STANDARDS

- A. National Fire Protection Association (NFPA)
  - 1. NFPA 70 National Electrical Code--Chapter 3

#### **PART 2 - PRODUCTS**

##### 2.01 MATERIALS AND COMPONENTS

- A. Conduit and Tubing: Galvanized steel rigid threaded conduit, electrical metallic tubing, intermediate metallic conduit.
- B. Flexible Conduit: Steel armor, flexible plastic jacketed type with liquidtight connectors (liquidtight flexible metallic conduit).
- C. Fittings:
  - 1. General: Approved for purpose. Water, concrete tight where required.
  - 2. Galvanized Rigid Steel Conduit (GRC): Threaded - no pressure type. Bushings with factory insulated throat.
  - 3. Electrical Metallic Tubing (EMT): Connectors and couplings to be case steel. Preinsulated connectors and couplings shall be compression, setscrew type. All connectors shall have insulated throats.
  - 4. Flexible Metallic Conduit: Clamp type, galvanized malleable iron with insulated throat.
  - 5. Liquidtight Flexible Metallic Conduit: Continuous copper ground in core; approved watertight.
- D. Expansion Joints: Offset or sliding type with bending straps and clamps. Approved for purpose.

##### 2.02 TYPE

- A. Utilize GRC or IMC in concrete with concrete-tight connectors or exterior with watertight connectors.
- B. Utilize electrical metallic tubing concealed in interior spaces or exposed in unfinished interior where not subject to physical damage.

- C. Utilize surface metal raceways for exposed runs in finished areas. Paint to match wall finish.
- D. Make connections to motors and equipment with flexible metallic conduit or liquidtight flexible metallic conduit. Use liquidtight type in damp locations. Minimum size 1/2-inch for motor connections. Use 3/8-inch only for fixture and control wiring. Provide sufficient length of flexible conduit to avoid transmission of vibration. Sizes not noted on the Drawings shall be as required by the NEC.

### 2.03 OUTLET BOXES

- A. Minimum Box: 4-inch box, 1-1/2-inches deep. Provide raised covers on bracket surface mounted outlet and plaster rings on flush outlets.
- B. Flush Switch and Receptacle Outlets for One or Two Devices: 4-inch square box, 1-1/2-inches or more deep, with single or two-gang plaster ring.
- C. Three or More Devices at One Location: Use one piece gang boxes with device cover. Install one device per gang.
- D. Provide galvanized steel interior outlet wiring boxes of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices.
- E. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations. Choice of accessories is Installer's option.
- F. Outlet Box Plate Covers:
  - 1. Flush Mounting: Bevelled, pressure formed, type 302 stainless steel, match device installed.
  - 2. Surface Mounting: Bevelled, steel, pressure formed.

### 2.04 WEATHERPROOF OUTLET BOXES

- A. Provide corrosion-resistant cast metal weatherproof outlet wiring boxes, of the type, shape and size, including depth of box, with threaded conduit ends, cast metal face plate with spring-hinged waterproof cap suitably configured for each application, including face plate gasket and corrosion proof fasteners.
- B. Weatherproof boxes to be constructed to have smooth sides, gray finish.
- C. Boxes used in contact with soil shall be cast iron alloy with gasketed screw cover and water-tight hubs.
- D. Weatherproof Plates: Cast metal, gasketed, for switches and receptacles provide spring loaded doors.

## 2.05 WEATHERPROOF JUNCTION AND PULL BOXES

- A. Provide galvanized sheet steel junction and pull boxes with screw-on covers; of the type, shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

## 2.06 PULLBOXES

- A. Pullboxes and Junction Boxes: Sheet metal (indoors) or cast metal (exterior or damp locations) construction, conforming to National Electrical Code, with screw-on cover.
- B. Flush Mounted Pullboxes: Provide overlapping covers with flush-head retaining screws, finished in light gray enamel.
- C. Box volumes shall meet NEC for size and number of entering conduits.

## PART 3 - EXECUTION

### 3.01 RACEWAY INSTALLATION

- A. Install conduit concealed in all areas excluding mechanical and electrical rooms, connections to motors, connections to surface cabinets, underfloor spaces, and above suspended ceilings.
- B. For exposed runs, attach surface mounted conduit with clamps.
- C. Coordinate installation of conduit in masonry work.
- D. Install conduit free from dents and bruises. Plug ends to prevent entry of dirt or moisture.
- E. Clean out conduit before installation of conductor.
- F. Alter conduit routing to avoid structural obstructions, minimizing crossovers. Bends and offsets shall be avoided where possible, but when necessary shall be made with an approved hickey or conduit bending machine. The use of a pipe tee or a vise for bending conduit will not be permitted.
- G. Provide UL approved expansion fittings complete with grounding jumpers where conduits cross building expansion joints and for long runs where conduit expansion may be excessive. Provide bends or offsets in conduit adjacent to building expansion joints where conduit is installed above suspended ceilings.
- H. Route all exposed conduits parallel or perpendicular to building lines.
- I. Allow minimum of 6 inches clearance at flues, steam pipes, and heat sources.
- J. Vertical Runs: Straight and plumb.
- K. Raceways Running in Groups: Run at same relative elevation, properly spaced and supported.
- L. Dissimilar Metals: Avoid contact with pipe runs of other systems.

- M. Lengths and Bends: Maximum number of bends in any run shall be the equivalent of four quarter bends (360 degrees total). Maximum length of any run shall be 300 feet, less 50 feet for each equivalent quarter bend. Junction and pull boxes shall be provided to maintain these limits.
- N. Provide waterproof seal for all exterior wall and underground raceway penetrations.
- O. All empty raceways shall be provided with pull string or #12 conductor.

### 3.02 BOX INSTALLATION

- A. Locate outlet boxes flush in areas other than mechanical rooms, electrical rooms, and above suspended ceilings.
- B. For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes to prevent condensation in boxes.
- C. Coordinate location and mounting heights with built-in units. Adjust outlet mounting height to agree with required location for equipment served.
- D. Locate pullboxes and junction boxes above suspended ceilings or in electrical rooms, utility rooms, or storage areas.
- E. Support: Secure boxes independent of entering conduits by attaching directly to structure with bar hanger, blocking, or flat side bracket.
- F. Identify each junction and pullbox with system description including branch circuit numbers of enclosed circuits.
- G. Conduit shall be securely fastened to all sheet metal outlet, junction, and pullboxes with galvanized locknuts, and bushing.
- H. Do not mount boxes back-to-back. Boxes on opposite sides of wall shall be separated by at least 3 inches.

END OF SECTION



## SECTION 26 05 53

### IDENTIFICATION FOR ELECTRICAL SYSTEMS

#### **PART 1 - GENERAL**

##### 1.01 WORK INCLUDED

- A. Permanent Identification of all electrical system components.

##### 1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. Identification shall conform to the latest edition of the National Electrical Code (NEC), Articles 110-21 as a minimum requirement.

#### **PART 2 - PRODUCTS**

##### 2.01 MATERIALS

- A. Laminated Plastic:
  - 1. Three layer, black front and back with white core.
  - 2. Engraved through outer layer to show white characters on black background.
  - 3. Beveled edges.
  - 4. Other colors as specified.
- B. Panelboard Directory Card: Fiberboard neatly typed for newly installed panels. Circuit changes to existing panels shall be noted on the directory card by hand printing in ink. When more than five changes have been made on the directory card, a new card shall be typed.

#### **PART 3 - EXECUTION**

##### 3.01 ITEMS TO BE IDENTIFIED

- A. Motor starters, power panels, lighting panels and the disconnecting devices contained therein.
- B. Disconnecting devices that are located in the area and not part of the items listed in 3.01 (A).
- C. Control panels, starters, pushbutton stations, pilot lights and other control devices.
- D. Transformers.
- E. Remote control devices.
- F. Conductors at both device and terminal strip terminations for control and instrumentation cables and conductors.
- G. Other items as specified or noted.

### 3.02 USE OF NAMEPLATES AND TAGS

- A. Panel designations, as described in paragraph 3.04 (A), and disconnecting devices in motor control centers shall be identified by nameplates that are engraved or etched. Nameplates that are engraved or etched shall have a black background with white letters. Letters for panel designations shall be a minimum of 1/2 inch high and letters for disconnect devices, mentioned in this paragraph, shall be smaller than the panel designation but have a minimum height of 3/8 inch.
- B. Disconnect devices in lighting panels and power panels shall be identified on the panelboard directory card.
- C. All wiring shall be identified with self-laminating, machine made thermal transfer labels.

### 3.03 APPLYING NAMEPLATES AND TAGS

- A. Nameplates that are engraved or etched, shall be attached with screws.
- B. Panelboard directory cards shall be placed in holders, provided for this purpose, located inside the panel doors.

### 3.04 IDENTIFICATION ON NAMEPLATES AND TAGS

- A. The voltage designation shall also be shown on the nameplate.
- B. Nameplates for disconnecting devices contained in panels and motor control centers shall show the equipment name and location by floor and column number. Voltage designation shall not be included when the voltage is the same as for the panel or motor control center.
- C. Nameplates on disconnect devices located in the area but not part of a panel or motor control center shall have the equipment name, power source identification, and voltage designation. Nameplates for disconnect devices located remotely from the equipment shall also show the equipment location by floor and column number.
- D. Nameplates on items listed in paragraph 3.01 (C) shall have the equipment name while the individual switches and lights shall have the function (such as start, stop, on, off, etc.).
- E. Panelboard directory cards shall list the circuit numbers and show the equipment name and location supplied by the circuits. Equipment locations shall be shown by floor and column numbers or by room numbers.

END OF SECTION

## SECTION 26 28 16

### OVERCURRENT PROTECTIVE DEVICES

#### **PART 1 - GENERAL**

##### 1.01 WORK INCLUDED

- A. Fuses
- B. Circuit Breakers

##### 1.02 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI).
  - 1. C37.16 Preferred Ratings, Related Requirements, and Application Recommendations for Low Voltage Power Circuit Breakers and AC Power Circuit Protectors.
  - 2. C37.17 Trip Devices for AC and General-Purpose DC Low-Voltage Power Circuit Breakers.
  - 3. C97.1 Low Voltage Cartridge Fuses 600 Volts or Less.
- B. Federal Specifications (FS).
  - 1. W-C-375B/GEN Circuit Breakers, Molded Case; Branch Circuit and Service, Federal Supply Classification (FSC) 5925.
  - 2. W-C-375/(1 through 20) Circuit Breakers, Molded Case, Branch Circuit and Service (FSC) 5925.
  - 3. W-F-1814 Fuse Cartridge, High Interrupting Capacity. (FSC) 5920.
- C. Institute of Electrical and Electronic Engineers, Inc. (IEEE).
  - 1. 20-73 Low Voltage AC Power Circuit Breakers Used in Enclosures (ANSI C37.13-73).
- D. National Electrical Manufacturer's Association (NEMA).
  - 1. FU-1 Low Voltage Cartridge Fuses.

##### 1.03 APPLICABLE REGULATIONS

- A. Underwriters' Laboratories (UL).
  - 1. UL 489-72 Molded Case Circuit Breakers and Circuit Breaker Enclosures.
  - 2. UL 198 E Class R Fuses.
  - 3. UL 198.2 High Interrupting - Capacity Fuses, Current Limiting Type.
  - 4. UL 869 Service Disconnects.
- B. National Fire Protection Association (NFPA).
  - 1. NFPA 70 National Electrical Code.

#### **PART 2 - PRODUCTS**

##### 2.01 FUSES

- A. Feeder, Branch Circuit and Service Entrance Fuses: 600 amperes and below, UL Class J or RK1 current limiting type, 600 volt 200,000 ampere interrupting capacity.

- B. Motor and Inductive Circuit Fuses: UL class RK5 time delay current limiting type, 600 volt, 200,000 ampere interrupting capacity.
- C. Control Circuit Fuses: UL Class J or R current, limiting type, 600V.

## 2.02 MOLDED CASE CIRCUIT BREAKERS

- A. Circuit Breakers:
  1. Connection to Bus: Bolt-on.
  2. Thermal-magnetic, molded case, with inverse time current overload and instantaneous magnetic tripping unless otherwise shown.
  3. Quick-make, quick-break, with tripped indication clearly shown by breaker handle taking a position between ON and OFF.
  4. Multi-pole breakers shall have a common internal trip. No handle ties between single pole breakers.
  5. Contacts: T-rated, for heavy duty switching applications.
  6. Breakers feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the breaker trip rating to prevent repeated arcing shorts resulting from frayed appliance cords.
  7. Additions to existing panelboards and switchboards shall match or be compatible with existing.
  8. Where used as service disconnects, breakers shall be listed for use as service entrance equipment.

## PART 3 - EXECUTION

### 3.01 FUSE INSTALLATION

- A. Label each switch to indicate type and rating of fuse installed.
- B. All fuses shall be selected to provide selective system coordination.
- C. Provide 10% (3 minimum) spare fuses of each size and rating used.

### 3.02 CIRCUIT BREAKER INSTALLATION

- A. Label each breaker located in switchboard or separate enclosure to indicate load served.
- B. Adjust settings on breakers to operate properly under actual field conditions and to provide selective system coordination.
- C. Update directory in panelboards which have new breakers installed.

END OF SECTION

## SECTION 26 51 13

### INDOOR LIGHTING FIXTURES, LAMPS AND BALLASTS

#### **PART 1- GENERAL**

##### 1.01 WORK INCLUDED

- A. This Section includes supply and installation of luminaires, supports and accessories; and supply of plaster frames, trim rings and backboxes for plaster, tile, drywall or concrete ceilings.
- B. Light fixtures, various control, and certain accessories are provided by Owner. Refer to plans and schedules for details.

##### 1.02 REFERENCE STANDARDS

- A. National Electrical Manufacturer's Association (NEMA).
  - 1. NEMA LE1: Fluorescent Luminaires.

##### 1.03 COORDINATION

- A. Confirm compatibility and interface of other materials with luminaire and ceiling system. Report discrepancies to the Engineer/Architect, and defer ordering until clarified.
- B. Supply plaster frames, trim rings and backboxes to other trades.

#### **PART 2 - PRODUCTS**

##### 2.01 ACCEPTABLE MANUFACTURERS

- A. Refer to Fixture Schedule and Plans for fixtures, accessories and division of responsibility.

#### **PART 3 - EXECUTION**

##### 3.01 COORDINATION

- A. Refer to Plans for exact locations with respect to ceiling construction.
- B. Prior to ordering mounting hardware and accessories, coordinate style of mounting with ceiling construction and trim details for ceiling system finally selected.

##### 3.02 SURFACE MOUNTING

- A. Attach with means that will draw fixtures snugly to finished surface without bending or tipping. Twist-on clips with studs not allowed on exposed "T" grid ceilings, except where specified. Support from channel above ceiling framing members with bolt at each corner of fixture.

##### 3.03 PENDANTS

- A. Support from structure per paragraph titled "SUPPORT".
- B. Provide steel, stranded safety cable between fixture and structure to support fixture in the event of a pendant breakage.

### 3.04 SUPPORT

- A. Suspended ceiling:
  1. Positively attach all light fixtures to the suspended ceiling system. The attachment device shall have a capacity of 150% of the lighting fixture weight acting in any direction.
  2. Support grid with No. 12 minimum gage hangers attached to the grid members within 3 inches of the corner of each fixture, attached to structure above.
  3. Attach two No. 12 minimum hangers from the fixture housing to the structure above. These wires may be slack.
  4. Where suspended fixtures do not align with grid, provide "bridging" above grid and support from structure.
  5. Support pendent-hung lighting fixtures directly from the structure above with No. 9 minimum wire or approved alternate support.
- B. Support all other fixtures from structure by method rated at least five times support weight.

### 3.05 ACCESS

- A. Recessed fixtures shall have code accessible supply. Use reach-through type fixtures in non-accessible ceilings or other suitable means. Coordinate with ceiling installer.

### 3.06 FIRE RATED CEILINGS

- A. Where a ceiling carries a fire rating, recessed fixtures shall carry UL rating for use in protective enclosures. Coordinate installation of protective enclosures to provide sufficient air space for heat dissipation. 3 inch minimum all around.

### 3.07 CLEAN-UP

- A. At time of acceptance, fixtures and lamps shall be clean, with visible labels removed. Touch-up any blemishes.
- B. Remove ballast leakage and dispose of cleaning materials in accordance with EPA regulations.

### 3.08 FIXTURES AS RACEWAYS

- A. Code Reference: NEC 410-31.
- B. Through-Wiring: In continuous rows of fluorescent lighting, a connection to a single point in the row indicates that the branch circuit conductors are to be routed through the fixture wiring compartments and a connection made to each ballast.

### 3.09 LAMP INSTALLATION

- A. Install lamps in accordance with manufacturer's instructions.

### 3.10 LAMP AND BALLAST DISPOSAL

- A. Contractor shall dispose of lamps and ballasts in conformance with EPA on local solid waste regulations.
- B. Provide Owner with certified shipping manifest and disposal certificates.

END OF SECTION

*MAPS OF  
ASBESTOS CONTAINING MATERIALS*



# SHELDON HIGH SCHOOL ADDITIONS

- Original Building.
- 1975 Addition #1.
- 1975 Addition #2.
- 1980 Addition.
- 1992 Remodel
- 2003 Addition

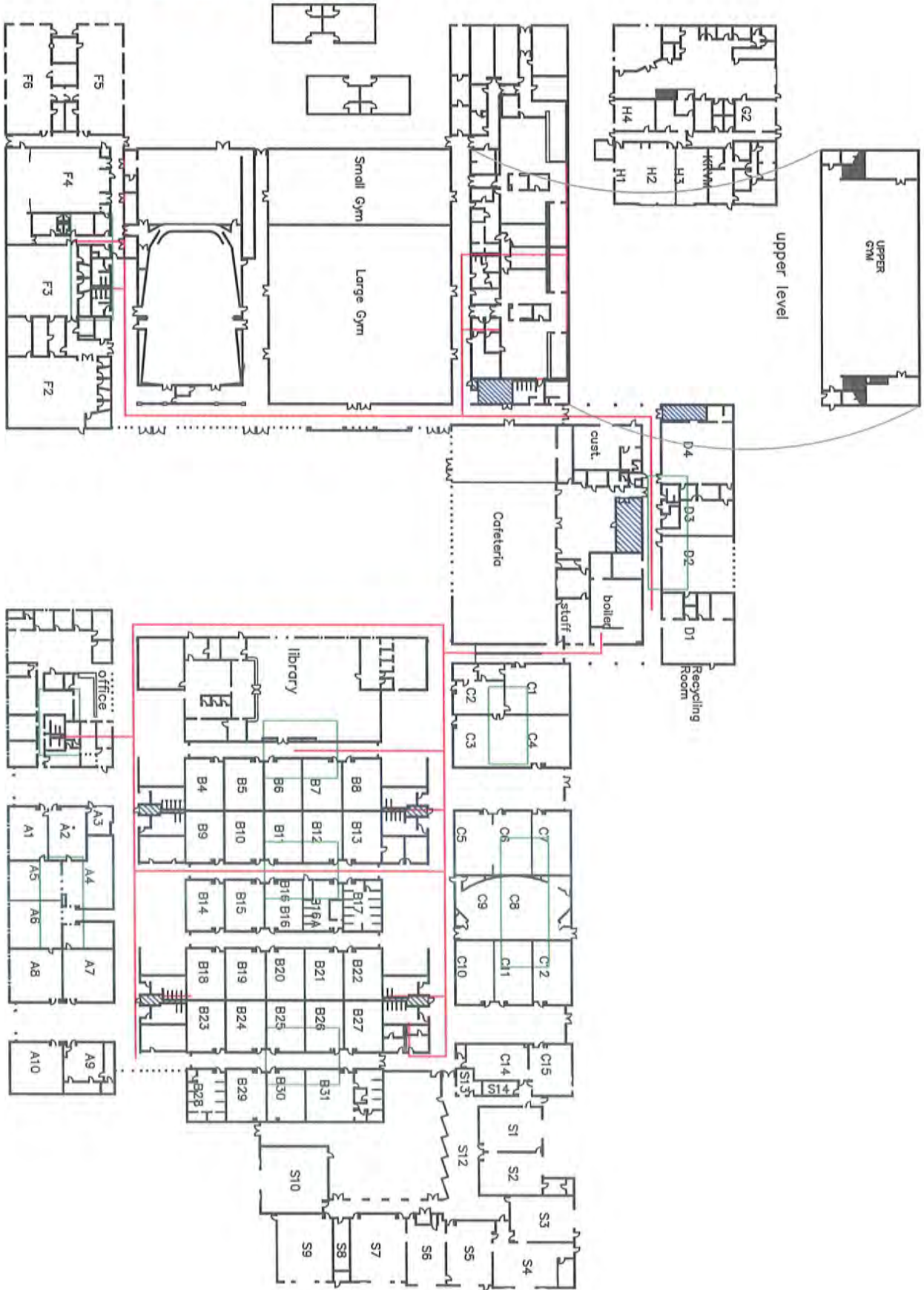


# SHELDON HIGH SCHOOL ASBESTOS CONTAINING TSI

DIAGRAM #1

- Asbestos containing pipe fitting insulation above ceilings.
- Asbestos containing pipe fitting insulation in mechanical spaces.
- Penthouses on roof.

Additional samples should be taken due to negative results in some locations.

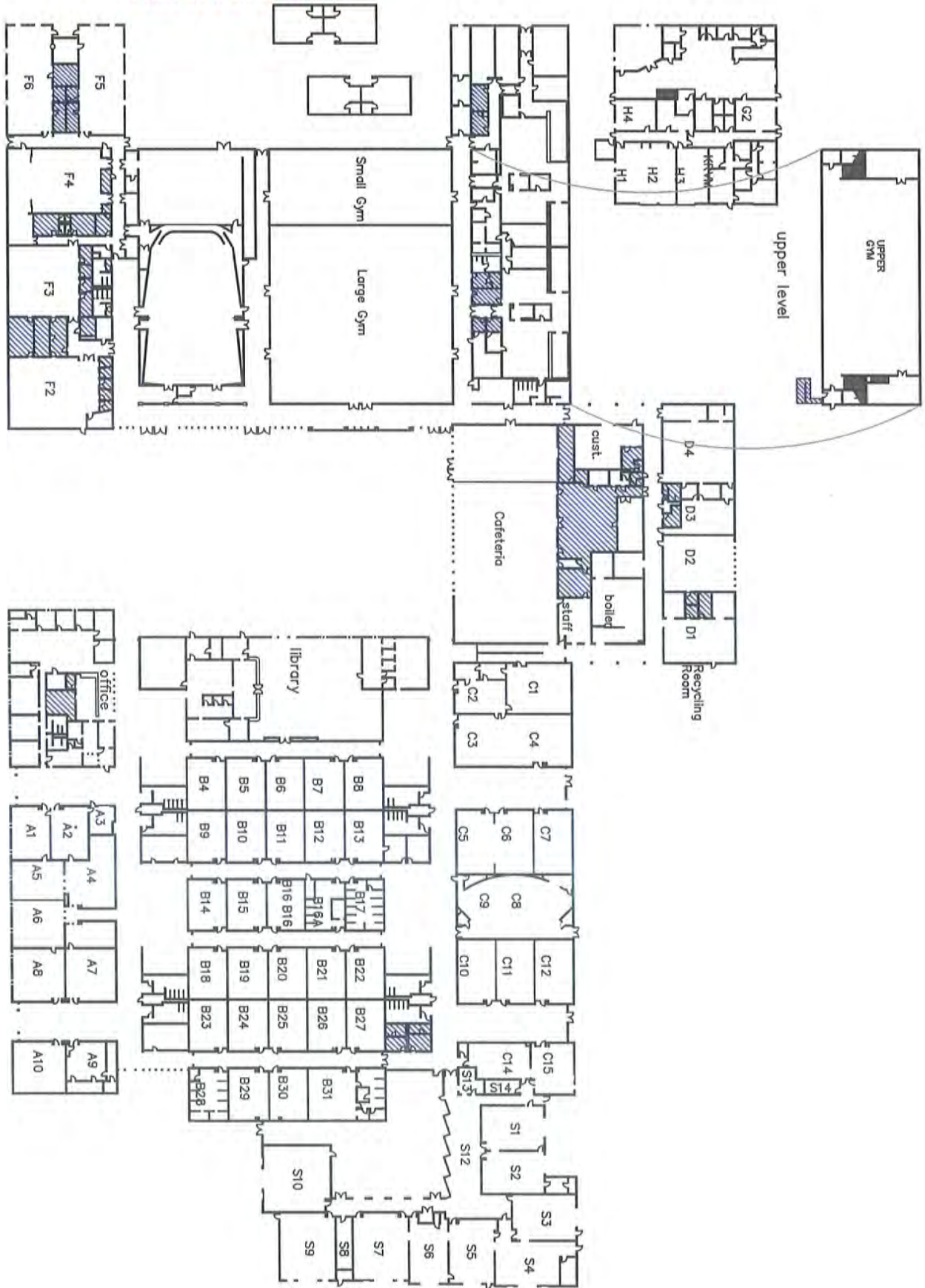


SHELDON HIGH SCHOOL  
 ASBESTOS CONTAINING CEILING MATERIALS

DIAGRAM #2

▨ Assumed ceiling tile mastic.

Note: Record keeping for the abatement projects are in Section XVI.



SHELDON HIGH SCHOOL  
 ASBESTOS CONTAINING WALL MATERIALS

DIAGRAM #3

— Assumed sheetrock partition walls, Addition dates unknown.



# SHELDON HIGH SCHOOL ASBESTOS CONTAINING FLOOR MATERIALS

DIAGRAM #4

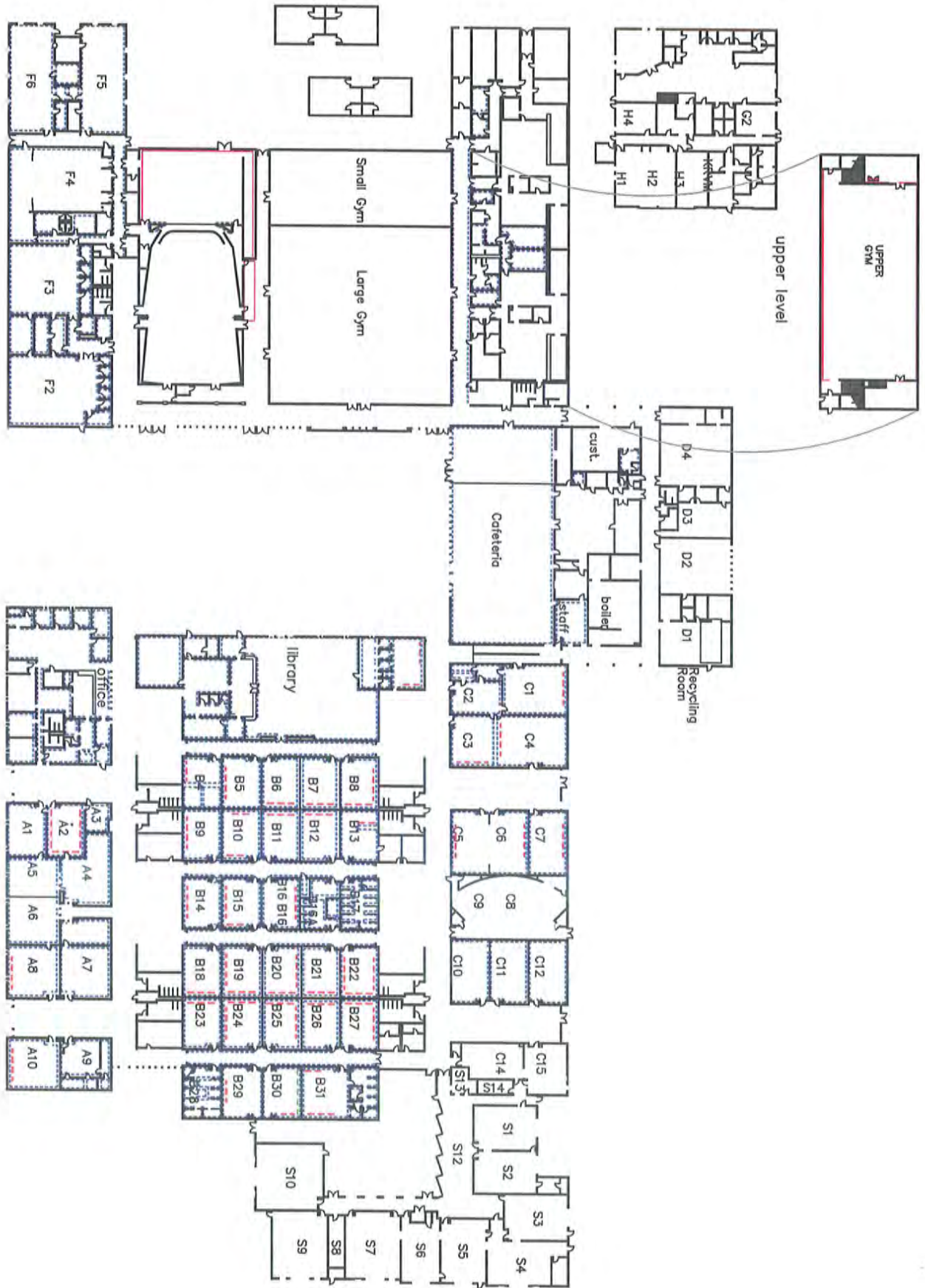
- Asbestos 9" X 9" floor tile and mastic.
- Asbestos 12" X 12" floor tile and assumed mastic.
- Assumed carpet mastic over floor tile and mastic.
- Assumed sheet vinyl.



# ASBESTOS CONTAINING MISCELLANEOUS MATERIALS

- - - Chalk boards and mastic.
- ..... Assumed cove base mastic.
- - - Assumed wainscot mastic.
- ▢ Assumed fire doors.
- Assumed window caulking.
- - - Cement asbestos board behind plywood in the Gym, on walls & ceilings above the stage.
- - - Cement asbestos board on walls of the mechanical room and above the stage.

DIAGRAM #5



# SHELDON HIGH SCHOOL NON-ASBESTOS CONTAINING THERMAL SYSTEM INSULATION

DIAGRAM #6

- All asbestos TSI was removed from the boiler room, see Section XVI.
  - Non-Asbestos flex duct connectors and / or fiberglass pipe insulation.
  - Non-Asbestos Thermal Systems Insulation (TSI)
- Additional samples of Hard Fittings should be taken due to negative results in some locations.



# SHELDON HIGH SCHOOL

## NON-ASBESTOS CEILING MATERIALS

- Non-asbestos 2' X 4' ceiling tile, stippled.
- Non-asbestos 2' X 4' ceiling tile, flisured.
- Non-asbestos 2' X 2' ceiling tile, stippled.
- Non-asbestos 12" X 12" ceiling tile, stippled.
- Non-asbestos 12" X 12" ceiling tile, perforated.
- Non-asbestos 12" X 12" ceiling tile, vinyl covered.
- Non-asbestos 12" X 12" ceiling tile, flisured
- Non-asbestos plaster, sandy texture.
- Non-asbestos plaster, sandy texture.
- Non-asbestos sheetrock, unfinished.
- Non-asbestos sheetrock, smooth texture.
- Non-asbestos troweled on texture
- All asbestos containing acoustic texture was removed from this area, see Section XVI.
- All asbestos containing 2' X 4' ceiling tile were removed in 1996, see Section XVI.

DIAGRAM #7





SHELDON HIGH SCHOOL  
NON-ASBESTOS CONTAINING WALL MATERIALS

DIAGRAM #8

- Non-asbestos vinyl covered sheetrock.
- Non-asbestos sheetrock, smooth.
- Non-asbestos plaster, sandy textured.
- Non-asbestos plaster, acoustic textured.
- - Non-asbestos fiber board, mastic, and sheetrock



# SHELDON HIGH SCHOOL NON-ASBESTOS FLOOR MATERIALS

- The asbestos containing floor materials have been removed from these area's.
- Non-asbestos Window putty.
- Non-asbestos floor tile mastic.

DIAGRAM #9



SHELDON HIGH SCHOOL  
NON-ASBESTOS MISCELLANEOUS MATERIALS

DIAGRAM #10

- Non-asbestos folding partition walls.
- Non-asbestos cove base mastic.
- ▨ The cement asbestos board was removed from this area in 1989, see Section XVI.

